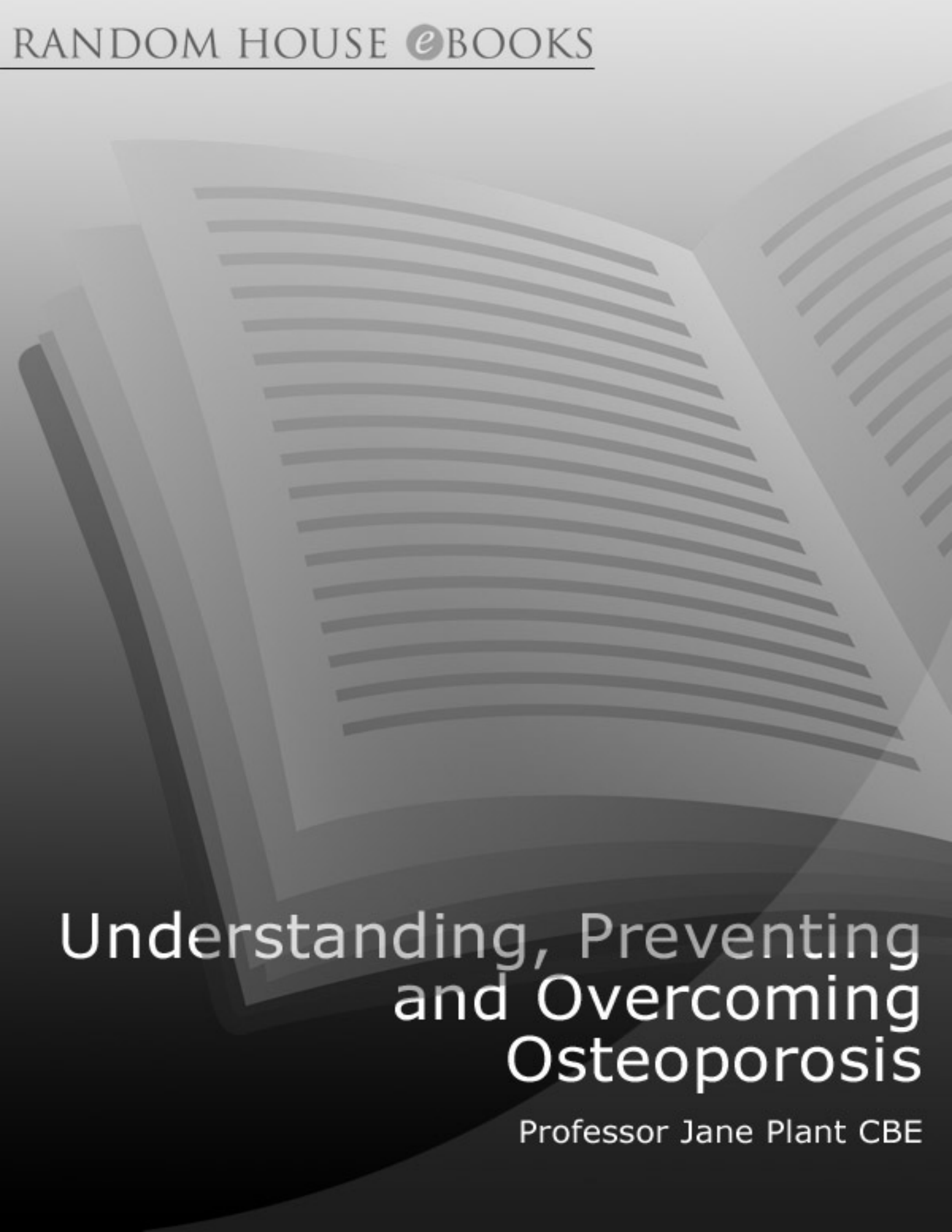


RANDOM HOUSE  BOOKS



Understanding, Preventing and Overcoming Osteoporosis

Professor Jane Plant CBE

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About the Book

One in five women and one in twelve men over the age of fifty in the UK already suffer from osteoporosis, and every three minutes someone has a fracture due to osteoporosis. In the USA it is predicted that one-in two women and one in eight men over fifty will have an osteoporosis-related fracture at some time in their lives. In Canada, more women die each year as a result of osteoporotic fractures than from breast and ovarian cancer combined.

The conventional Western medical view is that osteoporosis is an inevitable part of ageing. In this book, best-selling authors Professor Jane Plant and Gill Tidey take a radically different approach based on studies and analysis of mainstream scientific literature, and provide compelling, easy-to-read new evidence on the causes of the disease.

With the help of this book you can:

- Learn how to prevent osteoporosis
- Improve your chances of increasing your bone strength and health if you suffer from osteoporosis
- Discover how to get the best out of orthodox medicine
- Educate yourself about the fundamental importance of diet and lifestyle, with seven Food Factors and eight Lifestyle Factors, aimed at improving your bone health, appearance and outlook.
- Follow a new dietary regime based on delicious recipes
- Above all, discover a diet and lifestyle that will empower you to prevent and combat the disease.

About the Author

Professor Jane Plant is a widely respected scientist, who was awarded a CBE for her work in relation to human health and in 2005 was made a Life Fellow of the Royal Society of Medicine for her books on cancer. She contracted breast cancer in 1987 at the age of 42: the disease recurred a further four times. She adopted the diet and lifestyle changes she advocates in her book, and has now been clear of breast cancer for fifteen years.

understanding, preventing & overcoming
osteoporosis

**Professor Jane Plant CBE
and Gill Tidey**



Introduction

Until man can produce a blade of grass, nature can laugh at his so-called scientific knowledge. Remedies from chemicals will never stand in favour compared with the products of nature, the living cell of the plant and the final result of the rays of the sun, the mother of all life.

Thomas A. Edison

WELCOME

You may have picked up this book because:

- You suffer from osteoporosis
- You know someone or look after someone who suffers from osteoporosis and you want to help them
- One of your parents or close relatives suffers from the disease and you fear that in the future it will affect you

By opening this book, you have taken the first step in taking control of osteoporosis and its effects on your life and those dear to you. By reading the book and following the dietary and lifestyle advice it contains, we believe that most of you will be able to prevent yourselves from ever suffering from the disease. We also believe that those of you already suffering from osteoporosis will greatly improve your chances of increasing your bone strength and health, treating the disease, and regaining control of your lives.

We reject the conventional Western medical view that the disease is an inevitable part of ageing. We also challenge much of the orthodox prevention and treatment regimes promulgated in books, leaflets and websites by individual authors and by national institutes and charities

concerned with osteoporosis. These typically recommend a diet high in calcium, especially from dairy produce, vitamin D and other supplementation and medication which, in the case of post-menopausal women, is frequently hormone replacement therapy. All of this is aimed at merely slowing bone loss, rather than restoring bone health. Looking at the health outcomes of our many friends and colleagues with osteoporosis who have followed such advice, and at official predictions of future increases in the disease, it appears that such an approach on its own is powerless to protect us from the so-called 'silent epidemic' of osteoporosis.

In this book we take a radically different approach, based on studies and analysis of mainstream scientific literature. Our scientific training has taught us to observe and record objectively, to root out every fragment of information, to sift the relevant from the irrelevant, the rational from the irrational – and to do so with a healthy scepticism of science funded by organisations with a vested interest in obtaining a particular result.

We tell you how to get the best out of orthodox medicine. We also tell you about medications which, when used to treat other illnesses, ranging from allergies to cancer, can actually cause osteoporosis. We give you a new dietary regime of delicious nutritious recipes, based on the traditional dietary principles of China, where the rate of osteoporosis is forty to fifty times lower than that of rich, industrialised countries such as Germany, the UK and the USA. We include advice on obtaining the micronutrients that are essential for bone health, how to avoid bone-damaging pollutants, and which forms of exercise are suitable for different stages of osteoporosis, ages and personalities – and much more.

How can we speak with such confidence? Because we have had experience of using dietary and lifestyle factors, based on sound science, to prevent, control and treat

equally distressing and dangerous illnesses, most notably breast cancer.

Jane's own experience of breast cancer, which recurred four times after her initial mastectomy and involved her in four further operations, 35 radiotherapy treatments, irradiation of her ovaries to induce menopause and twelve chemotherapy treatments, is published in her international bestseller *Your Life in Your Hands*.¹ This book tells how she used her scientific knowledge and experience of working in China to identify dairy produce as the principal factor promoting her breast cancer. Within five weeks of eliminating all dairy produce from her otherwise healthy diet and lifestyle, a large secondary tumour in her neck had totally disappeared, and she has been free of cancer for ten years.

Your Life in Your Hands explores the epidemiological evidence connecting breast (and prostate) cancer with dairy consumption, as well as emerging, but nonetheless hard, scientific evidence in support of such a connection. It goes on to develop a diet and lifestyle based on seven food factors and five lifestyle factors (including eliminating all dairy produce) – a regime called 'The Plant Programme'. With her friend and fellow scientist, Gill Tidey, this was expanded in a second book, *The Plant Programme*,² which provides new evidence of the importance of diet in the prevention of cancer and other diseases and contains a large number of recipes for delicious, nutritious meals. *Your Life in Your Hands* is about why you should change your diet and lifestyle: *The Plant Programme* is about how to achieve this.^{[fn1](#)}

The Plant Programme also has a message for the sceptics. We said, in effect, 'Well, even if you are not totally convinced of the arguments in the books, when you can eat so well by following the regime, especially eliminating dairy, why not?' In science, such an approach is known as

the 'precautionary principle', and it is often put into effect in our everyday lives to reduce various risks.

Together, we have received hundreds of letters, phone calls and e-mails about our two books, mostly from people who have followed our advice and whose cancer (breast, prostate and some other types of the disease) is now in remission. Many readers have also told us how the advice has cured allergic conditions such as asthma and eczema, other skin problems such as psoriasis, and digestive problems including Crohn's disease and irritable bowel syndrome. Closer to home, Jane's husband Peter has experienced great improvement in his osteoarthritis since adopting the regime and no longer needs any pain-killing or other medication. All agree that their health has improved by following the Plant Programme.

Increasingly, we hear of medical professionals recommending the books *Your Life in Your Hands* and *The Plant Programme* to their patients, and they are now included in self-help packs provided by some general medical practices for their breast and prostate cancer patients. Increasingly, too, supermarkets and small shops are marketing and promoting dairy-free and other produce recommended in the Plant Programme.

THE TRIUMPH OF ADVERTISING OVER SCIENCE

In spite of the Plant Programme's success in helping to treat (and, hopefully, prevent) breast and prostate cancer and other conditions, many people have expressed concern about the possible effect of the diet on their bones and their risk of developing osteoporosis. The most commonly asked questions are 'Won't I get osteoporosis?' or 'Won't my osteoporosis get worse if I stop eating dairy products?' or 'Where do I get my calcium from?' The marketing of dairy produce as an essential source of calcium has been so strong that even some medical professionals, who should know better, insist that eliminating dairy produce from the

diet will lead to calcium deficiency and hence increase the risk of osteoporosis. In this book, we present evidence, from the peer-reviewed scientific literature, which strongly and convincingly refutes this. Indeed, we believe that we show that this is one of the great myths of our time!

While we have always been fully confident that our diet provides good sources of bio-available calcium, we have researched the subject further and found compelling evidence in the scientific literature that it is the Western diet and lifestyle that are at the root of the problem. Far from being beneficial, the consumption of dairy products, especially cheese, is actually damaging to those at risk from osteoporosis and other bone disease. **For many people, cheese is likely to be part of the cause, not the cure, of osteoporosis.**

However, the answer to osteoporosis is not as simple as just giving up dairy products. This book takes you through the detail of a whole new diet and lifestyle, with seven Food Factors and eight Lifestyle Factors (the 'Osteoporosis Plant Programme'), which will improve your bone health, appearance and outlook. The Osteoporosis Plant Programme is based on the Plant Programme, adapted particularly to improve bone health.

The extent and impact of osteoporosis are alarming. One in three women and one in twelve men over the age of fifty in the UK already suffer from the condition, and every three minutes someone has a fracture due to osteoporosis.³ In the USA it is predicted that one in two women and one in eight men over fifty will have an osteoporosis-related fracture at some time in their lives. In Canada, more women die each year as a result of osteoporotic fractures than from breast and ovarian cancer combined.⁴ Just as in the case of breast and prostate cancer, the statistics on the rate of osteoporosis are stark and shocking – and initially frightening. However, we believe that, as with breast and prostate cancer, we can set before you, clearly and plainly,

vital information from the mainstream scientific literature which can help you to cut drastically your risk of suffering from osteoporosis or from suffering further bone degeneration if you are already affected by the disease.

As in our earlier books on breast and prostate cancer, our aim is to present a diet and lifestyle that will empower you to fight osteoporosis, and help you to work with your doctor to help yourself.

One of the great fears that surrounds osteoporosis is that the condition is irreversible and, once someone has it, bones cannot be regenerated. Unfortunately, this is probably true for some individuals, although further degeneration can be prevented. On the other hand, scientific evidence from the US National Aeronautics and Space Administration (NASA) on the demineralisation and remineralisation of the bones of astronauts during and after space missions suggests that many people may be helped greatly by changing their diet and lifestyle. Evidence to support this view also comes from studies of people suffering from a condition called hyperparathyroidism. This condition causes serious calcium loss from the bones until the condition is treated, following which the bones are remineralised.

The Osteoporosis Plant Programme diet is rich in plant proteins, essential fatty acids, fibre, phyto-oestrogens, vitamins and minerals, including calcium, and much published research discussed in this book indicates that such a diet is protective against osteoporosis. The new information is strongly supported by epidemiological evidence which clearly shows that, like breast and prostate cancer, osteoporosis is mainly a disease of rich Western countries where people consume a diet that includes large quantities of animal protein (especially dairy produce and meat) and junk food and drink, with too little or inappropriate exercise.

We can almost hear those of you who have not read *Your Life in Your Hands* and *The Plant Programme* asking, 'Is this just another diet to add to all the other supposedly healthy diets being promoted in books, videos and the media?' There are so many out there: the so-called detoxifying diets, the fat-burning and the food-combining diets – often started and promoted by individual scientists or medical professionals, including dietitians, and then copied and quoted until the next one comes along. One of the difficulties for most people is that the advice given in different books is often conflicting: whereas one diet recommends eating lots of complex carbohydrates, another diet suggests that some such foods trigger a rise in blood-sugar levels and should be avoided or, at least, limited.

Some diets recommend eating lots of animal protein while others recommend cutting it out completely. It is usually difficult, if not impossible, to check the scientific basis of the recommended diets, because the scientific papers on which they are based are not included or are not attached to particular statements. One best-selling supposedly anti-cancer diet we read recently recommended meat and dairy produce (advice we strongly refute in *Your Life in Your Hands* and *The Plant Programme*). Anything good in dairy produce, whether calcium or the now highly promoted conjugated linoleic acids (CLAs), comes from plants or the action on them of microbes in the gut. Surely it is better to eat salads and vegetables that are not unlike the grasses that are eaten by cows in the first place – after all, they are the real source of the immensely strong bones of cows and hippopotamuses!

Other diet books begin by strongly recommending the elimination of all dairy produce or wheat, for example, but then actually include lots of recipes containing these ingredients.

Our work is different. We are both natural scientists – trained to consider the complexity of the real world and to

search for fundamental processes to explain natural phenomena such as earthquakes and volcanoes. Similarly, our approach to understanding the origins of disease is based on fundamental causative factors. This is a radically different approach to that of many medical researchers, whose work is mainly directed towards finding pills and potions to treat symptoms. Let us illustrate this fundamental difference of approach:

Jane has worked on environmental geochemistry for much of her career. This has involved her and her team in studying concentrations of chemical elements in the environment that are so high that they are toxic, or so low that they cause deficiency conditions. Such geochemical anomalies in soils and water can be related to specific diseases in people who eat foods grown in such soils or drink the affected water. To take a couple of examples, by the mid-1960s the levels of the trace element cadmium were so high in the Jinzu River Basin in Toyama, Japan, that people consuming local food and water suffered severe skeletal problems with the development of a painful disease known as 'Itai-Itai' (translated 'Ouch-Ouch') disease. Elsewhere in continental Asia, low concentrations of the trace elements selenium and iodine are associated with serious skeletal problems resulting in bone deformation ('Big Bone disease'). What has been demonstrated, time and again, by this type of environmental study is that until the fundamental cause of such problems is identified there is little or nothing that can be done to help the affected individuals by way of pills and potions or to stop the disease recurring. Until you have found the underlying cause or causes (whether it is bone or any other disease) and effectively neutralised it, you cannot claim to have dealt with the problem.

Gill's scientific career has been marked by a different kind of search for fundamental explanations. As a micropalaeontologist working for the oil exploration

industry in south-east Asia, her job was to identify and determine the age of very small fossils that occur in sedimentary rocks. This painstaking task was carried out while an exploration well was actually being drilled, and accurate dating of the layers of rocks through which drilling was taking place was crucial. Gill discovered early in her career that it was absolutely essential to consider the whole assemblage of fossil evidence, and never to jump to quick conclusions based on partial evidence, no matter how compelling.

As scientists we feel that it is essential to develop our diet and lifestyle recommendations based on similar sound science using information from the mainstream peer-reviewed literature and to give the sources of the information we use. Also, instead of simply buying recipes we have worked closely together to develop dishes which follow the scientific principles spelled out in the book, and which are also delicious to eat. There is nothing extreme or dangerous in our diet: it is not based on single-issue science such as the amount of insulin release triggered by different foods. Instead, it is based on the principles of the Chinese diet. A healthy diet involves many complex factors, and the traditional Chinese diet has been evolved over many centuries by one of the most biologically successful peoples on Earth, using sustainable agricultural practices. It is an agricultural and dietary philosophy that has been studied in detail by a team of eminent scientists from Cornell, Oxford and Beijing universities during the 1980s, who showed its great health benefits.⁵

The contrast between the progressive evolution of the traditional Chinese approach and the Western approach of discarding the old in favour of the latest fad is illustrated by the following:

A Short History of Medicine⁶

Doctor, I have an earache:

2000 BC	Here, eat this root.
AD 1000	That root is heathen. Here, say this prayer.
AD 1850	That prayer is supersition. Here, drink this potion.
AD 1940	That potion is snakeoil. Here, swallow this pill.
AD 1985	That pill is ineffective. Here, take this antibiotic.
AD 2000	That antibiotic is artificial. Here, eat this root.

HOW TO USE THIS BOOK

Before you begin, it might help if we give you a few tips on how to use the book. The book comprises two main sections. The first seven chapters, forming Section 1, are about understanding, preventing and treating osteoporosis from a scientific perspective. Section 2 is a cookbook packed with delicious bone-healthy recipes.

If you simply want to prevent or treat osteoporosis you may wish to begin by reading Chapters 5 and 6 and following the straightforward advice on diet and lifestyle given there and in Section 2. The recommended diet is based on principles borrowed from Asia, especially China.

If, on the other hand, you wish to explore in greater depth and understand the basis for this advice, you should begin at Chapter 2 and follow the argument through. We hope to take you through the scientific detective story and to answer the two key questions that are at the heart of scientific endeavour – ‘Why?’ and ‘How?’: *why* does this disease affect increasing numbers of people, and *how* can people equip themselves to prevent and treat it?

In Chapter 1 we take you through the diagnosis and treatment of osteoporosis by orthodox medicine, as seen through the experiences of friends and colleagues who suffer from the disease. Treatment has typically involved consuming large quantities of dairy produce in the diet, taking calcium and other supplements such as magnesium and vitamin D, frequently combined with hormone

replacement therapy for post-menopausal women. Much of this conventional wisdom is challenged later in the book.

Chapters 2 to 4 form the 'why' section of the book. In Chapter 2, we review what osteoporosis is, with particular reference to the role of the skeleton and bones in the human body. The skeleton is not only an amazing structural support system for the body; it is also the body's principal store of calcium and other alkaline minerals and bases such as bicarbonates, which can be released into the bloodstream as the body's first line of defence in neutralising or buffering excess acid build-up. In Chapter 3 we consider what the mainstream scientific literature has to say about the real causes of the disease. The chapter includes epidemiological evidence on the distribution of osteoporotic disease in relation to diet in 33 countries of the world. This evidence is considered in the light of the latest scientific information on the processes in the body that can cause bone degeneration and hence osteoporosis, particularly excess acidity generated by poor diets, stress and other lifestyle factors typical of Western industrialised countries.

Chapter 4 provides a simple, clear explanation of the latest scientific evidence on which foods and activities produce acidity or alkalinity in the body. Emphasis is placed on achieving a proper balance because, although bone damage is strongly linked to excess acidity, excess alkalinity in the body can cause other types of ill health. The importance of levels of 'good' trace elements, such as zinc and copper, in maintaining bone health is also considered. The chapter includes a table listing many common foodstuffs against their acidity rating when metabolised in the body; another table lists the calcium and magnesium contents of these foods. These tables will help you to plan your diet to protect against bone degeneration. The chapter also provides information on how to obtain

essential nutrients from food, without the need to resort to man-made mineral and vitamin supplements.

The next part of the book (Chapters 5 and 6) is the 'how' section. It develops simple dietary and lifestyle factors based on the scientific evidence in the early chapters of the book. In Chapter 6, we provide sound lifestyle tips – for example how natural herbal methods can be substituted for hormone replacement therapy, what is a sensible amount of alcohol to consume, why and how to reduce cigarette smoking, how to limit your exposure to substances such as cadmium and other pollutants which are harmful to bones, types of medication to be concerned about and appropriate exercise.

In Chapter 7, we consider why we continue to be fed all the wrong messages by the popular media and many medical professionals. Is there really a conspiracy between the dairy industry, calcium and vitamin supplement manufacturers, those marketing hormone replacement therapy and Dual X-ray Absorptiometry (DEXA) machines, some charities and the medical profession? We discover what we, as individuals, can do to help ourselves and reduce our exposure, as a society, to the appalling human, social and economic costs of the so-called 'silent epidemic' of osteoporosis.

In the second major section of the book we provide you with the 'Osteoporosis Plant Programme' Cookbook. This includes more than 100 recipes for delicious meals that are protective of bone and good for health generally. As in *The Plant Programme*, these meals are based on using healthy, nutritious ingredients to prepare dishes that are tempting and delicious. The recipes are simple, practical and easy to follow, and are mostly inexpensive and quick to make.

Finally we should like to assure you that we have no agenda driven by factors such as funding from vested-interest groups to promote particular foods or other products and that we have, as far as possible, tried to

identify and eliminate such biased sources of information from our work.

[fn1](#) The diet and lifestyle described in this book and in *Your Life in Your Hands* and *The Plant Programme* are meant to complement, not replace, orthodox medicine. Before making any changes, discuss the new evidence presented with your doctor.

SECTION 1

1 Bones of Contention

IN THIS CHAPTER we look at the orthodox medical approach to osteoporosis (originally known as 'brittle bone disease') through the eyes and experiences of some of our friends, colleagues and associates afflicted by it. We look at the way the World Health Organisation (WHO) has developed the use of measured bone mineral density to estimate the risk of fracture due to osteoporosis. We then review the much-repeated risk factors for low bone mineral density and osteoporosis, and the recommended preventative measures promulgated by leading medical professionals and charities.^{1, 2, 3} By observing the treatment and health outcomes of our many friends and colleagues with osteoporosis and reading the official predictions of the future impact of the disease, we are led to conclude that conventional medicine on its own appears powerless to protect us against the 'silent epidemic' of osteoporosis.

Our two previous books, *Your Life in Your Hands*⁴ and *The Plant Programme*,⁵ were written from personal experience of successfully battling with potentially life-threatening disease against the odds – in Jane's case five episodes of breast cancer and in Gill's case a diagnosis of pre-cancerous calcification of the breasts. However, neither of us has any personal experience of osteoporosis (or brittle bone disease).

Jane, now in her late fifties, continues to do geological field visits as part of her job and her collisions with rocks are often to be seen recorded in the bruises on her arms and legs. Gill is in her mid-fifties and, while no longer a professional geologist, is an active, handicap-12 golfer, and often plays in regional and county matches. Both of us tend

to dash around the UK and other countries wearing high-heeled shoes and carrying heavy luggage (mostly comprising weighty committee papers and reports, or sets of golf clubs and related paraphernalia). This is behaviour guaranteed to put great stress on the bones and skeleton, especially the hip joint and back. Yet neither of us has suffered any serious pain, or other problems associated with our bones or skeletons that the occasional visit to the osteopath has not dealt with.

Contrast this with the situation of one of our friends, Joanne (not her real name), a former headmistress turned civil servant, who a few years ago (then in her mid-fifties) was walking across her carpeted office wearing sensible flat-heeled shoes carrying only a thin file. Suddenly and quite unexpectedly she fell to the floor in severe pain. She was rushed to hospital and diagnosed with a fractured hip. She was in plaster and forced to walk on crutches for many weeks. After a series of tests she was told that she was suffering from osteoporosis and that this was why her hip had fractured. **Put more starkly, Joanne had not fallen and fractured her hip - her hip had fractured, and she had fallen down.**

We both have many women friends and acquaintances in their fifties and over. Because osteoporosis is now so common ([see here](#)), we know many women diagnosed with the disease. They are, by and large, sensible, independent women who have or have had professional careers. They know all the conventional wisdom on risk factors and preventative measures about osteoporosis and they try to help themselves and take charge of their health. Many of them feel the same sense of anger and frustration that Jane felt when she was first diagnosed with breast cancer. They all, in one way or another, want an answer to the question, 'Why me?' - especially when they believe they have been very responsible about their health.

Take the case of Mary (a combination of several people), an executive in a hospital trust. She is always beautifully groomed. She exercises regularly and often has a slight tan from skiing or other outdoor pursuits. She has never smoked and has only an occasional glass of wine with a meal out. She has hardly been ill in her life and was totally shocked when, aged 54, she attended an executive health check organised by her employers and was told that she had severe osteoporosis in both of her hips and lower spine.

Harriet (also a combination of several people), a nurse who is married to a doctor, was first diagnosed as suffering from osteoporosis when she began to complain of severe indigestion and breathlessness. Tests revealed that the problems were being caused by the changing shape of her spine which was compressing her lungs, stomach and other organs of her digestive tract as a result of osteoporosis. Despite following the best medical advice available, she has now, in her early seventies, lost height and has a clearly developed 'Dowager's Hump' (more grandly termed 'kyphosis' by conventional medicine). This is caused by the shortening and curvature of her upper spine (symptoms thought to be the result of multiple fractures of the spinal vertebrae)⁶. She even has problems with her teeth, which her dentist is working hard to keep aligned.

We know hardly any men with the disease, probably because fewer of them are affected by it. This is thought to be because the physiological and hormonal differences between males and females mean osteoporosis affects a much higher proportion of women than men. Although we have not been able to discuss their illness with our two former colleagues who have been diagnosed with osteoporosis (remember – Men are from Mars) we are aware that they had to give up their jobs and it was most noticeable that they lost height over a relatively short period of time – a few months in one case.

Before we try to answer the ‘why me?’ question for these and other sufferers of osteoporosis, let us look at the illness and its formal definition by the World Health Organisation (WHO). Let us also look at the conventional risk factors for osteoporosis according to orthodox medicine, and at the diagnosis, treatment and advice on prevention that is given to sufferers by national agencies, charities and other organisations concerned with osteoporosis.^{[7](#), [8](#), [9](#)}

WHAT IS OSTEOPOROSIS?

Osteoporosis is a disease characterised by low bone mass and deterioration of bone tissue, leading to increased bone fragility and risk of fracture, particularly of the hip, spine and wrist. Osteoporosis has been called the ‘silent disease’ because bone loss occurs initially without symptoms. People may not know that they have osteoporosis until, as in Joanne’s case, their bones become so weak that a sudden strain, bump, fall or movement causes a hip to fracture, or a vertebra to collapse. Collapsed vertebrae may initially be felt as severe back pain or other symptoms caused by compression of internal organs by a collapsing, curving spine, as was the case with Harriet, or they may become apparent in a loss of height, spinal deformities, or severely stooped posture.

The WHO has developed specific criteria for osteoporosis, whereby the risk of bone fracture depends on the measurement of bone mineral density. In 1991, a panel of experts defined osteoporosis as ‘a systemic disease characterised by low bone mass and microarchitectural deterioration of the skeleton, leading to enhanced bone fragility and increased fracture risk’.^{[10](#)} This definition is based on two of the skeletal changes considered to be most important in osteoporosis – the diminished bone mass and the diminished bone quality. At the time, however, the

definition was considered impractical, since the only means of assessing bone quality then was the study of samples of bone (removed surgically), a procedure which was costly and did not lend itself to periodic monitoring.

In 1994, following the introduction of new methods of measuring bone density, a new WHO panel of experts defined 'low bone mass' more precisely.¹¹ The group began by agreeing two basic concepts. First, they assumed that fracture risk must be lowest when bone mineral density is highest – some time between ages twenty and forty in healthy people. The standard average bone mineral density was based on results obtained on a specially selected group or sample of 25-year-old Caucasian women (i.e. white women of European descent). The relative risk for fracture in this standard reference group was arbitrarily set at 1.0. Secondly, the expert panel agreed, on the basis of several studies,¹² that the relative risk for fracture increases as bone mineral density decreases, and that the relationship between bone mineral density and fracture risk is continuous and there is no fracture threshold. Thus, patients with a bone mineral density score significantly below the mean for peak bone mass are considered to be at increased risk of bone fracture.

For someone with a score of -2, the risk of suffering an osteoporosis-related fracture is considered double that of someone with the same bone mineral density as the average of the WHO sample. A score of -4 doubles the risk again, to four times that of those individuals with 'normal' bone density.

The fact that the WHO sample consisted entirely of Caucasians has led to criticism of the basis of the method and its general diagnostic value. The use of bone mineral density has also been criticised¹³ on the basis that the density can vary depending on the size of a woman's bones as well as on the concentration of minerals in the bone. Because a larger person generally has larger bones than a

smaller person does, the energy beam will encounter more minerals in a large person's bones than in a small person's of the same density. Hence, even if the true densities of both bones are identical, DEXA or DPA tests will indicate a higher 'density' in a large-boned than a small-boned person. Thus, it is argued, there are no bone mineral density levels that are 'high', 'low' or 'normal' for everyone. What is normal for one woman may be low or high for another. Nevertheless, despite any shortcomings of bone mineral density testing, it is valuable as an index of changes (either deterioration or improvement) in bone mineral density over time, provided that the same equipment is used on each occasion.

TESTING FOR OSTEOPOROSIS

The most common test, Dual Energy X-ray Absorptiometry (DEXA or DXA) is usually used to scan the bones of the lower back and hips. The machine produces a printout that compares your bone density with that of the average obtained on the WHO sample of young white women. The difference between your bone density and this average is then calculated to give a score. Scores between 0 (no difference from the average) and -1 are considered normal. Scores between -1 and -2.5 are diagnosed as suffering from osteopenia, or at increased risk of osteoporosis. Where scores are below -2.5, patients are diagnosed as having osteoporosis.

For those of you who are more mathematically inclined, the scores are standard deviations (or average differences from the average).

See below for more information on this and other diagnostic methods.
